UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

April 20, 2012

Mr. Christopher Wamser
Site Vice President
Entergy Nuclear Operations, Inc.
Vermont Yankee Nuclear Power Station
185 Old Ferry Road
P.O. Box 500
Brattleboro, VT 05302-0500

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION – NRC INSPECTION REPORT 05000271/2012008

Dear Mr. Wamser:

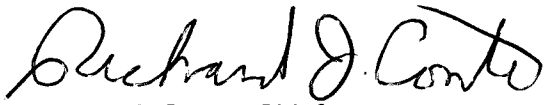
On March 20, 2012, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the Vermont Yankee Nuclear Power Station. The enclosed report documents the results of the inspection, which were discussed with you and other members of your staff on January 27, March 8, and March 20, 2012.

This inspection was an examination of activities under your renewed operating license related to the completion of commitments made during the renewed license application process and your actions to comply with the conditions of your renewed license. Under the renewed operating license, entry into the period of extended operation occurred on March 22, 2012. The inspection was of those activities and facilities accessible during the power production. Within these areas, the inspection involved examination of selected procedures, representative records, observations of activities, and interviews with personnel.

On the basis of the samples selected for review, there were no findings identified during this inspection. However, as a consequence of this inspection, some of your administrative processes, and aging management programs, required modification. Further, we noted that license amendment changes, dated March 5 and March 12, 2012, addressed needed changes to your plans from the original license renewal application. Accordingly, we intend to implement an additional phase of this inspection on or about the spring 2013 Refueling Outage in order to follow-up on these issues in accordance with Inspection Procedure 71003, "Post Approval Site Inspection for License Renewal."

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR 2.390) of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's document system Agencywide Document Access and Management System. The Agencywide Document Access and Management System is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,



Richard J. Conte, Chief
Engineering Branch 1
Division of Reactor Safety

Docket No. 50-271
License No. DPR-28

Enclosure:
NRC Inspection Report 05000271/2012008

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/RA/

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U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Docket No.:	50-271
License No.:	DPR-28
Report No.:	05000271/2012008
Licensee:	Entergy Nuclear Vermont Yankee, LLC Entergy Nuclear Operations, Inc.
Facility:	Vermont Yankee Nuclear Power Station
Location:	Vernon, VT
Dates:	January 9 – 13, 23 – 27, and March 19 – 20, 2012
Inspectors:	M. Modes, Senior Reactor Inspector, Division of Reactor Safety G. Meyer, Senior Reactor Inspector, Division of Reactor Safety S. Chaudhary, Reactor Inspector, Division of Reactor Safety T. O'Hara, Reactor Inspector, Division of Reactor Safety J. Lilliendahl, Reactor Inspector, Division of Reactor Safety
Approved by:	Richard J. Conte, Chief Engineering Branch 1 Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000271/2012008; 1/9 – 13, 1/23 – 27, and 3/19 – 20, 2012; Vermont Yankee Nuclear Power Station; Post Approval Site Inspection for License Renewal IP71003.

The report covers three weeks of onsite inspection of the implementation of license renewal commitments during the period from Vermont Yankee's last refueling outage and prior to entering the period of extended operation. The inspection was conducted by five regional based inspectors and reviewed a sample of license renewal commitments, license renewal related license conditions, and the process for handling newly identified systems, structures, and components in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 54.37(b).

REPORT DETAILS

Summary of Plant Status

Vermont Yankee Nuclear Power Station was at power during the period of this inspection.

4. OTHER ACTIVITIES

4OA5 Post-Approval Site Inspection for License Renewal – IP 71003

On March 21, 2011, NRC issued a renewed operating license to the licensee Entergy Nuclear LLC, based on a review of the Vermont Yankee License Renewal Application submitted on January 27, 2006, and verification of the activities proposed by the applicant. In March 2011, NRC issued Supplement 2 to NUREG 1907, "Safety Evaluation Report Related to the License Renewal of Vermont Yankee Nuclear Power Station," listing commitments the licensee made to address the U.S. Nuclear Regulatory Commission (NRC) concerns raised during the review process. The commitments were aggregated in Appendix A of the Safety Evaluation Report, Supplement 2. The period of extended operation began on March 22, 2012.

By letter (BVY 12-017), dated March 16, 2012, the licensee notified the NRC that implementation of activities required to be completed prior to the period of extended operation have been completed and can be verified by the NRC. The licensee indicated for Commitments 3, 6, 16, and 19 the activities completed were in conformance with a letter (BVY 12-016), dated March 12, 2012, requesting a modification to the license to allow for changes in the commitments. Prior to these letters, the licensee submitted a license amendment request (BVY 12-015), dated March 5, 2012, in order to changes to License Conditions 3.P and 3.Q. In essence, the March 5 request, if approved by NRC staff, would allow the license renewal commitments to be placed in the Updated Final Safety Analysis Report (UFSAR) supplement and clarify that future activities would be as noted in the NUREG 1907 and the UFSAR supplement.

This inspection was performed by five NRC Region I based inspectors to evaluate the license renewal activities at the Vermont Yankee Nuclear Power Station in accordance with Inspection Procedure (IP) 71003 "Post-Approval Site Inspection for License Renewal." The inspection consisted of a review and observation of activities, systems, structures, and components accessible during the period of power operation subsequent to the last refueling outage and prior to the beginning of the extended period of operation.

The inspectors reviewed supporting documents including completed surveillances, conducted interviews, performed visual inspection of structures, systems, and components and observed selected activities described below. The inspection verified the licensee completed the necessary actions to comply with the commitments that are made a part of the license, as well as complied with specific license conditions that are a part of the renewed operating license.

The commitments selected were those with activities that are not part of a regular review as part of the Reactor Oversight Program such as the American Society of Mechanical Engineers (ASME) Section XI Inservice Inspection program and are of heightened regulatory interest, safety significance, or have increased risk implications.

a.1 Inspection Scope

The inspectors verified license conditions added as part of the renewed license, license renewal commitments with associated aging management programs, and license renewal commitments revised after the renewed license was granted, are implemented in accordance with Title 10 of the *Code of Federal Regulations* (CFR) Part 54, "Requirements for the Renewal of Operating Licenses for Nuclear Power Plants."

Commitment 2

> Commitment 2: Fifteen percent of the top guide locations will be inspected using enhanced visual inspection technique, enhanced visual inspection technique (EVT-1), within the first 18 years of the period of extended operation, with at least one-third of the inspections to be completed within the first 6 years and at least two-thirds within the first 12 years of the period of extended operation. Locations selected for examination will be areas that have exceeded the neutron fluence threshold (specified in the license renewal application).

By way of procedure SEP-RVI-006, Revision 2, Section 2.1.2 parts (a), (b), and (c), the applicant committed to inspect 5 percent of the top guide locations using an EVT-1 during the first 6 years of extended operation, with an additional 5 percent in subsequent 6 year intervals for a total of 15 percent by the end of 18 years.

Commitments 3 and 4

> Commitment 3: The Diesel Fuel Monitoring Program will be enhanced to ensure ultrasonic thickness measurement of the fuel oil storage and fire pump diesel storage (day) tank bottom surfaces will be performed every 10 years during tank cleaning and inspection.
>
> Commitment 4: The Diesel Fuel Monitoring Program will be enhanced to specify ultrasonic test (UT) measurements of the fuel oil storage and fire pump diesel storage (day) tank bottom surfaces well have acceptance criterion greater than or equal to 60 percent of normal thickness (Tnom).

These commitments require the licensee enhance the Diesel Fuel Monitoring Program to perform UTs of the bottoms of the fuel oil storage tank and the fire pump diesel storage tank every 10 years. The acceptance criteria for these tests will be in accordance with the American Petroleum Institute Standard 653 and the Steel Tank Institute Standard SP001.

The inspectors reviewed the license renewal application, Safety Evaluation Report, and the licensee's implementation plan, and discussed these commitments with applicable plant staff and license renewal personnel. The inspectors reviewed the ultrasonic testing reports, testing results evaluations, and applicable industry standards. For both the fuel oil storage tank and the fire pump diesel day tank, the tank bottom thickness results were greater than the acceptance criteria. Also, evaluations of the effect of corrosion on the tank bottoms determined that the thicknesses were projected to remain above the acceptance criteria at least until additional ultrasonic testing is performed in 10 years. The inspectors reviewed the general condition of the fire pump diesel day tank and found it to be acceptable.

On March 12, 2012, the licensee sent a letter to the NRC requesting an amendment to its license to revise Commitment 3 in order to clarify that cleaning and inspecting of the fire pump diesel storage (day) tank is not required in order to perform ultrasonic thickness measurements of the tank bottom. The licensee proposed the commitment language be changed to read:

> The Diesel Fuel Monitoring Program will be enhanced to ensure ultrasonic thickness measurement of the fuel oil storage tank bottom surface will be performed every 10 years during tank cleaning and inspection. Ultrasonic thickness measurement of the fire pump storage (day) tank bottom will be performed every 10 years.

Commitment 6

> Commitment 6: A computerized monitoring program (e.g., FatiguePro™) will be used to directly determine cumulative fatigue usage factors (CUF) for locations of interest.

The licensee submitted the Vermont Yankee license renewal application on January 27, 2006, with an enhancement to the Fatigue Monitoring Program, as stipulated in Commitment 6, to replace the manual cycle counting in use at the time of the application. This commitment was a part of the original application and was not in response to any inquiry from the NRC. On March 30, 2007, NRC issued "Safety Evaluation Report with Confirmatory Items Related to the License Renewal of Vermont Yankee Nuclear Power Station," which contained Appendix A, "Commitment Listing," in which Commitment 6 was recorded. Subsequent versions of the Safety Evaluation Report issued as NUREG-1907 did not revise the commitment.

Before receiving its renewed license (March 21, 2011) and prior to the implementation date of the commitment (March 21, 2012) the licensee revised Commitment 6 in January 2011 to rescind the use of computerized fatigue monitoring, i.e., FatiguePro™, replacing FatiguePro™ and use their existing method of manual cycle counting. This was based, in part, on their review of a similar license renewal application, in which the staff accepted the manual counting method. On May 19, 2011, the licensee informed NRC of the commitment change in licensee letter BVY 11-026. This modification was made based on Safety Evaluation Report Section 1.7 (Revision 0) discussion of the license conditions which states:

> The second license condition requires future activities identified in the UFSAR supplement to be completed prior to the period of extended operation.

The actual License Condition 3.Q issued is much different as follows:

> The UFSAR supplement, as revised, submitted pursuant to 10 CFR 54.21(d), describes certain future activities to be completed prior to and/or during the period of extended operation. The licensee Nuclear Vermont Yankee, LLC and the licensee Nuclear Operations, Inc. shall complete these activities in accordance with Appendix A of Supplement 2 to NUREG-1907, "Safety Evaluation Report Related to the License Renewal of Vermont Yankee Nuclear Power Station," issued March 2011 (excluding Commitment No. 37, which is superseded by the steam dryer license condition). The licensee Nuclear Vermont Yankee, LLC or The licensee Nuclear Operations, Inc. shall notify the NRC in writing when activities to be completed prior to the period of extended operation are complete and can be verified by NRC inspection.

Based on these two references the licensee followed the generally established principle that completion of the commitment listed in Appendix A was an obligation "to be completed prior to the period of extended operation," however, the language and nature by which the commitment was implemented could be controlled either by 10 CFR 50.59 or NEI 99-04, "Guidelines for Managing NRC Commitment Changes" (ML003680088). However, the language of the Vermont Yankee specific license condition was not exactly the same as previous renewed licenses and therefore needed clarification.

During the October 2011 IP 71003 Phase I inspection, the NRC staff questioned the exact meaning of renewed License Condition 3.Q as repeated above. The licensee's renewed license was subsequently determined to mean any commitment listed in Appendix A of the Safety Evaluation Report, as originally worded, was a direct part of the license condition, and therefore an obligation as defined in NEI 99-04. The licensee was informed of this new information on March 8, 2012, and this resulted in two license amendment requests.

As a consequence of this determination, the licensee concluded they could not make changes to the commitment under the more flexible rules of NEI 99-04, for a commitment, or under the rules of 10 CFR 50.59 as of March 8, 2012. The licensee concluded it was now required to request a modification of the license, following the rules of 10 CFR 50.90, for each change made to the wording of any commitment. The licensee entered a corrective action (CR-VTY-2012-00388) that included an extent-of-condition review to determine if any other commitments had been modified without following the rules of 10 CFR 50.90.

As a consequence of its review the licensee submitted a letter on March 12, 2012 (BVY 12-016), requesting an amendment to its license to revise Commitment 6 (as well as Commitments 3, 16, and 19) to revert to manual counting, in accordance with the requirements of 10 CFR 50.90 and its license condition.

Prior to the letter of March 12, 2012, and in response to the letter of May 19, 2011, the NRC performed a technical review to determine the acceptability of the proposed modification to Commitment No. 6 and preliminarily did not object to the proposed change. The licensee proposed the commitment be revised to read:

> Manual Cycle counting will be used to track and compare accumulated cycles against allowable values to determine if cumulative usage factors are required to be updated.

The licensee also submitted a request on March 5, 2012 (BVY 12-015), to modify its license to clarify the license condition so the wording of a commitment placed in the UFSAR, by the licensee, would be controlled by 10 CFR 50.59 while the implementation of the commitment would remain an obligation under the license.

The request letter of March 5, 2012, added the following commitment:

> Vermont Yankee will include the list of License Renewal Commitments identified in Appendix A of Supplement 2 to NUREG-1907 (excluding Commitment No. 37 and including Commitment No. 55) in the UFSAR supplement, as revised, submitted pursuant to 10 CFR 54.21.

The licensee's amendment requests were being reviewed by NRC staff. Since the commitment change was completed in January 2011, the commitment was not an obligation (March 2011) and the 50.90 process was not required to be used. The information report in May 2011 was merely an extension of the NEI 99-04 process.

Commitment 8

> Commitment 8: Procedures will be enhanced to specify that fire damper frames in fire barriers will be inspected for corrosion. Acceptance criteria will be enhanced to verify no significant corrosion.

The inspectors reviewed the commitment completion review report and licensee procedure OP 4019, "Surveillance of Plant Fire Barriers and Fire Rated Assemblies," to verify that the surveillance procedure had been enhanced to include fire damper frame inspections. The inspectors noted that OP 4019 included a schedule, list of dampers, and acceptance criteria to adequately control the required inspections. The inspectors also interviewed the project manager to review any operating experience or implementation issues.

Commitment 9

> Commitment 9: Procedures will be enhanced to state that the diesel engine sub-systems (including the fuel supply line) will be observed while the pump is running. Acceptance criteria will be enhanced to verify that the diesel engine did not exhibit signs of degradation while it was running; such as fuel oil, lube oil, coolant, or exhaust gas leakage.

The inspectors reviewed the license renewal application, Safety Evaluation Report, the licensee implementation plan, the revised procedures, and discussed this commitment with applicable plant staff and license renewal personnel. The inspectors noted the revised monthly surveillance procedure contained steps specifying observation of the fire pump diesel and its sub-systems, and stipulated acceptance criteria for these observations. The 18-month surveillance procedure contained steps specifying observation of the fire pump diesel and its sub-systems, but did not specify related acceptance criteria. The licensee issued a procedure change request, which provided the appropriate acceptance criteria for the 18-month surveillance procedure. The inspectors verified the proposed procedure change specified acceptance criteria for the 18-month surveillance. The inspectors observed the general condition of the fire pump diesel and its sub-systems, and found the conditions to be acceptable.

Commitment 10

> Commitment 10: Fire Water System Program procedures will be enhanced to specify that in accordance with the National Fire Protection Association (NFPA) 25 (2002 edition), Section. 5.3.1.1.1, when sprinklers have been in place for 50 years a representative sample of sprinkler heads will be submitted to a recognized testing laboratory for field service testing. This sampling will be repeated every 10 years.

The inspectors reviewed the commitment completion review report and applicable fire protection work orders to verify that all sprinkler systems which will reach 50 years of age during the period of extended operation will be subjected to testing in accordance with NFPA 25-2002, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems." The inspectors noted that the installation date was determined for all sprinkler systems to determine the required initial test date. The inspectors also noted documentation tracking the scheduling of the inspections at 10 year intervals after the initial 50 year inspection. The inspectors interviewed the project manager to review any operating experience or implementation issues.

Commitment 11

> Commitment 11: The Fire Water System Program will be enhanced to specify that wall thickness evaluations of fire protection piping will be performed on system components using non-intrusive techniques (e.g., volumetric testing) to identify evidence of loss of material due to corrosion/microbiologically influenced corrosion (MIC). These inspections will be performed before the end of the current operating term and during the period of extended operation. Results of the initial evaluations will be used to determine the appropriate inspection interval to ensure aging effects are identified prior to loss of intended function.

The inspectors reviewed the commitment completion review report and ultrasonic test results to verify that representative samples were selected and that the test results did not indicate any current concerns. The inspectors noted that based upon worst case test results and conservative estimates of corrosion rates, all samples are expected to be above the minimum required wall thickness at the end of the period of extended

operation. The inspectors also interviewed the project manager to review any operating experience or implementation issues.

Commitments 13 and 43

> Commitment 13: Implement the Non-Environmental Qualification Inaccessible Medium-Voltage Cable Program as described in License Renewal Application Section B.1.17.

The program as described in the license renewal application consists of periodic inspections of manholes for water collection and testing of medium and low voltage cables which are exposed to significant moisture.

> Commitment 43: Establish and implement a program that will require testing of the two 13.8 kV cables from the two Vernon Hydro Station 13.8 kV switchgear buses to the 13.8 kV/69 kV step up transformers before the period of extended operation and at least once every 6 years after the initial test.

The inspectors reviewed the commitment completion review reports, manhole inspection results, and cable test results to verify that potential aging effects to inaccessible cables were being adequately managed. The inspectors reviewed tan delta and insulation resistance test results to verify that cable testing frequencies were established based on cable performance. The inspectors verified that the cable testing program included medium and low voltage cables.

The inspectors also reviewed the manhole inspection results and determined that all of the manholes had been inspected and future work orders were designed to inspect the manholes on appropriate frequencies and at least once every year. The inspectors reviewed OP-PHEN-3127, "Natural Phenomena Operating Procedure," to verify that the manholes will be inspected under conditions of high river level or after heavy rain. The inspectors also interviewed the project manager to review any operating experience or implementation issues.

Commitment 43 applied the Commitment 13 cable testing program to the cables between Vermont Yankee and the Vernon Hydro Station. The inspectors reviewed the cable testing program to ensure that the cables between Vermont Yankee and Vernon Hydro Station were included in the cable testing program, the cables had been tested satisfactorily, and the cable testing frequency was set at 6 years.

Commitment 12

> Commitment 12: Implement the Heat Exchanger Monitoring Program as described in License Renewal Application (LRA) Section B.1.17.

As documented in Inspection Report 05000271/2011011, the inspectors reviewed the conditions of three heat exchangers which were opened for cleaning and inspection during the refueling outage in October 2011.

The inspectors reviewed the license renewal application, Safety Evaluation Report, the licensee implementation plan, and discussed this commitment with applicable plant staff and license renewal personnel. The inspectors reviewed the licensee's corporate and Vermont Yankee site procedures for the heat exchanger monitoring program. The heat exchanger monitoring program is an existing program that organizes the heat exchanger inspections and maintenance activities, previously performed individually, within the preventive maintenance program. As part of the license renewal application process additional heat exchangers were added to the program. Inspections of these heat exchangers are planned in the next few years. The inspectors reviewed the three most recent Heat Exchanger Program Health Reports and corrective action documents associated with degradations on three heat exchangers.

The inspectors noted that ENN-SEP-HX-001, "Heat Exchanger Program," Revision 1, addressed the heat exchangers added during license renewal but was not clear regarding heat exchangers being covered and the inspection approaches for baseline and periodic inspections, largely due to non-specific use of "samples" and "sampling." The inspectors reviewed Revision 2 of the procedure which included clear, specific guidance and resolved the concern.

Commitment 14

> Commitment 14: Implement the Non-Environmental Qualification Instrumentation Circuits Test Review Program as described in LRA Section B.1.18.

The program, as described in the license renewal application, consists of enhancing the Intermediate Range Monitoring and Local Power Range Monitoring detector testing programs to collect data sufficient to verify the adequacy of the Intermediate Range Monitoring and Local Power Range Monitoring cables.

The inspectors reviewed the commitment completion review report, revised test procedure, and initial test results to verify that any potential aging effects in the Intermediate Range Monitoring or Local Power Range Monitoring cables are being adequately managed. The inspectors reviewed VY-RPT-00018, "Non-EQ Sensitive Instrumentation Circuits Cable and Connection Evaluation," to verify the initial test results demonstrated adequate performance of the associated cables. The inspectors also interviewed the project manager to review any operating experience or implementation issues.

Commitment 15

> Commitment 15: Implement the Non-Environmental Qualification Insulated Cables and Connections Program as described in LRA Section B.1.19.

The program as described in the license renewal application was to manage the aging effects of cables and connections exposed to adverse localized environments by visually inspecting a representative sample of accessible insulated cables and connections.

The inspectors reviewed the commitment completion review report and inspection results to verify that potential aging effects to cables and connections are being adequately managed. The inspectors reviewed VY-RPT-11-00019, "Cable and Connection Inspection Summary Report," which documented the inspection of the plant for adverse localized environments and aging effects to cables and connections. The inspectors reviewed the work orders and condition reports that were generated as a result of the walk down to verify that conditions adverse to quality were being identified and resolved.

Commitment 16

> Commitment 16: Implement the One-Time Inspection Program as described in LRA Section B.1.21.

The inspectors reviewed the license renewal application, Safety Evaluation Report, the licensee implementation plan, and discussed this commitment with applicable plant staff and license renewal personnel. The inspectors reviewed the licensee's corporate procedure for one-time inspection, the summary report of the one-time inspection program (draft and final), and inspection testing matrix. The inspectors reviewed inspection reports, material/environment evaluations, and condition reports further evaluating discrepancies. The licensee concluded that one-time inspections demonstrated that no additional aging management activities were needed.

The inspectors noted that the "One-Time Inspection Program as described in LRA Section B.1.21" included inspection of the cast austenitic stainless steel main steam line flow restrictors. These inspections were discussed in Amendment 16 to the License Renewal Application submitted by the licensee and in the Safety Evaluation Report. The inspectors noted the inspection matrix listed these inspections as not applicable, and the licensee had not initiated any regulatory process to revise its commitment.

The licensee personnel stated that preparations for the inspections had determined that the inspections were impractical. In addition, the licensee determined that plans for one-time inspections of the reactor vessel leak-off line should be covered under Commitment 53. In letter BVY 12-016, dated March 12, 2012, the licensee addressed these concerns by modifying License Renewal Application Section A.2.1.23 which describes the application of the One-Time Inspection Program at B.1.21.

Commitment 17

> Commitment 17: Enhance the Periodic Surveillance and Preventive Maintenance Program to assure that the effects of aging will be managed as described in LRA Section B.1.22.

The "Periodic Surveillance and Preventive Maintenance Program" includes periodic inspections and tests that manage aging effects not managed by other aging management programs.

The inspectors reviewed Work Order 52295664-01, cleaning and inspection (mechanical and electrical) of reactor recirculation ventilation unit-7 in the reactor building completed during the fall 2011 refueling outage. The inspectors reviewed Work Order 52329127-01, cleaning and inspection of Aircon SAC-1 Control Room Air Conditioner (Package Fan Coil for the Control Room HVAC Filters and Cooling System) completed in August 2011. Inspection of the reactor building crane rails and girders is scheduled for completion during February 2012.

This program has resulted in revisions to the included equipment maintenance procedures to specify that the inspection procedure is fulfilling a license renewal aging management commitment.

Commitment 18

> Commitment 18: Enhance the Reactor Vessel Surveillance Program to proceduralize the data analysis, acceptance criteria, and corrective actions described in the program description in LRA Section B.1.24.

This commitment, which requires writing a procedure, was implemented by revising SEP-FTP-VTY, Revision 1, "Reactor Vessel Fracture Toughness and Surveillance Material Testing At Vermont Yankee," to stipulate data analysis, and acceptance criteria, by incorporating Boiling Water Reactor Vessel Internals Project (BWRVIP) 86 and BWRVIP 135. After determining the effects on plant operating parameters caused by new data provided by the BWRVIP 135 program, the revised procedure was enhanced to clarify that significant departures from expected performance should be entered into the corrective action program in accordance with EN-LI-102.

Commitment 19

> Commitment 19: Implement the Selective Leaching Program as described in LRA Section B.1.25.

The inspectors reviewed the license renewal application, Safety Evaluation Report, the licensee implementation plan, and the licensee commitment closure verification, and discussed this commitment with applicable plant staff and license renewal personnel. The inspectors reviewed the licensee's corporate selective leaching procedure, the draft and final selective leaching summary report, inspection sample matrix, inspection reports, and technical report with destructive examinations of some copper alloy components.

During review of the sample matrix, the licensee identified that some samples for gray cast iron in a raw water environment were actually copper alloy material mischaracterized as gray cast iron; this necessitated additional samples. Later the inspectors reviewed the two additional samples inspected.

The inspectors reviewed the "Evaluation of the Gray Cast Iron Valves in the Fire Protection System Based on External Ultrasonic Test Examinations," dated January 18, 2012, and a later version dated March 20, 2012, discussed the evaluation

with testing personnel and applicable license renewal staff. The licensee had applied the ultrasonic testing to 20 fire protection system components, which were not otherwise accessible for selective leaching inspection. A sample of gray cast iron material with selective leaching from another Entergy facility had been used to qualify the ultrasonic test method. The evaluation of each component determined the wall thicknesses, calculated a maximum possible leaching thickness, and projected potential wall thickness loss over 20 years. In all but one case, the licensee determined that the remaining wall thicknesses would exceed the design minimum wall thickness. For the one valve with insufficient calculated wall thickness, the licensee planned to repeat the inspection in 5 years.

The inspectors determined the licensee's ultrasonic test method had a sound technical basis. The results of the test, when combined with the multiple conservatisms of the evaluations, and the visual and hardness inspections of other gray cast iron valves, supports a conclusion that aging management activities for selective leaching are not required. The inspectors requested a repeat inspection on a second valve with the least calculated margin (8 percent) above the design minimum wall thickness. The licensee determined that visual inspecting the two valves by March 21, 2014, would be more appropriate and issued work orders to perform these inspections.

The inspectors noted the Nuclear Regulatory Commission guidance in NUREG-1801, Revision 1, "Generic Aging Lessons Learned (GALL) Report" and the Licensee statements made in their license renewal application at Section B.1.25 "Selective Leaching Program" have no provision for ultrasonic testing for selective leaching. In letter BVY 12-016, dated March 12, 2012, the licensee addressed this concern by modifying the aging management program the commitment refers to in the original renewal application at A.2.1.27.

The inspectors reviewed the "Results of Soil Corrosivity Testing – Buried Pipe Initiative, Vermont Yankee," dated December 12, 2011, which documented the testing and analysis of soil conditions in the vicinity of buried fire piping with gray cast iron valves. The report provided a detailed technical basis why selective leaching was not likely to occur on the buried valves, the visual inspection would be superfluous, and the excavation to enable the inspection unnecessary. The inspectors determined this approach had a reasonable technical basis and was conservative. However, the NRC guidance in NUREG-1801, Revision 1, GALL Report and licensee statements made in the license renewal application at Section B.1.25 "Selective Leaching Program" have no provision for soil corrosivity testing for selective leaching, nor had the licensee initiated any regulatory process to revise its commitment. In letter BVY 12-016, dated March 12, 2012, the licensee addressed this concern by modifying A.2.1.27 of the original application.

Commitment 20

> Commitment 20: Enhance the Structures Monitoring Program to specify that process facility crane rails and girders, condensate storage tank enclosure, CO_2 tank enclosure, N_2 tank enclosure and restraining wall, condensate storage tank pipe trench, diesel generator able trench, fuel oil pump house, service water

pipe trench, man-way seals and gaskets, and hatch seal and gaskets are included in the program.

The applicant has enhanced the Structural Monitoring Program to specify that process facility crane rails and girders, condensate storage tank enclosure, CO_2 tank enclosure, N_2 tank enclosure and restraining wall, condensate storage tank pipe trench, diesel generator cable trench, fuel oil pump house, service water pipe trench, man way seals and gaskets, and hatch seals and gaskets are included in the program.

The inspectors reviewed the commitment completion review report, the Structural Monitoring Program documents and program procedure. Specifically, inspectors reviewed the procedure EN-DC-150, "Condition Monitoring of Maintenance Rule Structures" to verify the procedure was updated to identify the specific structures and components. Attachment 9.17, of the procedure, listed the structures, components, and equipment covered by the monitoring program and monitoring procedure. In addition, the inspectors reviewed the previous inspection and monitoring reports to assess the implementation and effectiveness of the program.

Commitment 22

Commitment 22: Guidance for performing structural examinations of elastomers (seals and gaskets) to identify cracking and change in material properties (cracking when manually flexed) will be enhanced in the Structures Monitoring Program procedure.

The inspectors reviewed the revised and updated procedures to verify that guidance for performing structural examinations of elastomers (seals and gaskets) to identify cracking and change in material properties (cracking when manually flexed) had been enhanced in the structural monitoring program.

Procedure EN-DC-150, Sections 5.9 and 8.0 have been revised and updated to provide guidance for inspection and monitoring of elastomers.

Commitment 24

Commitment 24: System walk down guidance documents will be enhanced to perform periodic system engineer inspections of systems in-scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4 (a)(1) and (a)(3). Inspections shall include areas surrounding the subject systems to identify hazards to those systems. Inspections of nearby systems that could impact the subject system will include structures, systems, and components that are in-scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4 (a)(2).

The licensee modified Procedure EN-DC-178, "System Walk down Program" and Procedure ENN-MS-S-004, "VYNPS System Categorization" to require periodic walk downs to inspect for the effects of aging on system equipment and components.

Commitment 25

> Commitment 25: Implement the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program as described in LRA Section B.1.29.

Section B.1.29 of the license renewal application states the program will be "comparable to the program described in NUREG-1801 Section XI.M13." The applicable edition of Nuclear Regulatory Commission guidance in NUREG-1801, GALL Report is Revision 1. In addition to addressing critical elements of CASS aging, Section B.1.29 states:

> "EPRI, the BWR Owners Group and other industry groups are focused on reactor vessel internals to ensure a better understanding of aging effects. Future BWRVIP reports, EPRI reports, and other industry operating experience will provide additional bases for evaluations and inspections under this program. This program will supplement reactor vessel internals inspections required by the BWR Vessel Internals Program to assure that aging effects do not result in loss of the intended functions of reactor vessel internals during the period of extended operation."

After the details of the Vermont Yankee license renewal application were established, the programmatic details of the thermal aging and neutron irradiation embrittlement of cast austenitic stainless steel were resolved and specified in the BWRVIP 234-2009. Section 6.7 of the program states:

> "The inspection recommendation given are based on the following criteria: (1) fluence less than 3 x 1020 n/cm2, (2) adequate toughness (> 255 kJ/m2), and (3) applied stress (< 5ksi)."

The licensee used BWRVIP 234-2009 as the method necessary to manage the aging effect of thermal aging and neutron irradiation embrittlement of CASS and proceduralize the specifications in the CASS aging management program. Using the BWRVIP 234-2009 thresholds, all of Vermont Yankee's CASS components, within the scope of the original application, were below the stress threshold of the selection criteria established in BWRVIP 234-2009. Thus, the components screened out of the aging management program and needed no inspection.

The criteria used in BWRVIP 234-2009 is different than the criteria stipulated in the NRC guidance in the applicable Revision 1 of NUREG-1801, GALL Report, Section XI.M13, because the inspection threshold in the guidance is established based on a single criterion of fluence > 1017 n/cm2 (for E > 1 MeV). This threshold is three orders of magnitude lower than the threshold used in BWRVIP 234-2009 for fluence. The inspectors noted Revision 2 of NUREG-1801, GALL Report, Section XI.M13, accepted BWRVIP 234-2009 as an aging management.

The licensee revised LO LAR 2010 0256 to resolve the criteria differences. The commitment was to implement Section B.1.29 of the application, and Section B.1.29 of the application includes the provision to supplement the approach using "future BWRVIP

reports, EPRI reports, and other industry operating experience" to "provide additional bases for evaluations and inspections under this program." Under the provisions of B.1.29 the application of BWRVIP 234-2009, as an additional bases for evaluation, is acceptable.

Commitment 26

> Commitment 26: Procedures will be enhanced to flush the John Deere Diesel Generator cooling water system and replace the coolant and coolant conditioner every three years."

The inspectors reviewed the license renewal application, Safety Evaluation Report, and the licensee's implementation plan, and discussed this commitment with applicable plant staff and license renewal personnel. The inspectors reviewed the revised preventive maintenance procedures, and the work order for the three-year preventive maintenance of this diesel generator completed on June 11, 2011. The licensee's inspection is on a 3 year cycle. The inspectors observed the general condition of the John Deere diesel generator and its cooling systems, and found the conditions to be acceptable.

Commitment 28

> Commitment 28: Revise program procedures to indicate that the Instrument Air Program will maintain instrument air quality in accordance with ISA S7.3.

LO-LAR-2010-00259 was created to track progress on this commitment.

The licensee has revised Procedure RP 4620 to include ISA S7.3 as the sampling criteria for air quality. Also, the licensee has added a supervisory review of the sampling results to ensure that the criteria of ISA S7.3 are met during sampling analysis.

Commitment 29

> Commitment 29: Vermont Yankee Nuclear Power Station will perform one of the following: (1) Install core plate wedges, or (2) Complete a plant-specific analysis to determine acceptance criteria for continued inspection of core plate hold down bolting in accordance with BWRVIP 25 and submit the inspection plan and analysis to the NRC two years prior to the period of extended operation for NRC review and approval.

The licensee completed a plant specific analysis (Option 2) which demonstrated that operation, without core plate wedges, and with periodic VT-3 inspection of the core plate bolts will maintain acceptable margin above loss of bolt preload. The analysis was submitted to the NRC on March 18, 2011, satisfying the requirement contained in this commitment.

Commitment 30

> Commitment 30: Revise System Walkdown Program to specify CO_2 system inspections every 6 months.

The inspectors conducted a walk down of the CO_2 system including the CO_2 storage tank, associated piping and controls and alarms. The inspectors also conducted a walk down of the vital switchgear room and the associated suppression system bottles.

The NRC determined in the Safety Evaluation Report, 3.0.3.1.9, "System Walkdown Program," that "those portions of the applicant's System Walkdown Program for which the applicant claimed consistency with GALL AMP XI.M36" is "consistent with the GALL AMP." The staff concluded the "System Walkdown Program provided assurance that the program will manage aging effects, e.g., the loss of material and leakage, of the external surfaces of components."

The inspectors reviewed the most recent Fire Protection System walk down report and System Health Report completed by the Fire Protection Engineer. The inspectors also reviewed TRM 4.13.D "Surveillance Requirements," and the National Fire Protection Association certification inspection results for the CO_2 storage tank.

The inspectors reviewed the design of the CO_2 system holding tank, an ASME, Boiler and Pressure Vessel Code, Section 8 pressure vessel, and determined that it was not possible to visually inspect the steel walls to detect signs of aging in the form of corrosion. The CO_2 tank walls are made of steel and are covered with insulation and a sheet metal cover. The sheet metal cover is designed to protect the insulation and the tank from weather related aging effects caused by the tank's location out-of-doors.

The licensee has defined the system periodic walk down to ensure that the sheet metal cover is visually inspected to detect signs of aging. Should aging effects become evident, the licensee will enter the condition into the corrective action process and address the condition based upon appropriate engineering guidance. The evidence of aging affects at the insulation cover gives sufficient time to respond to the deterioration of the tank so that the effect of the aging is managed.

Commitment 31

> Commitment 31: Revise Fire Water System Program to specify annual fire hydrant gasket inspections and flow tests.

The inspectors reviewed the commitment completion review report and surveillance procedures to verify that the procedures had been enhanced to include fire hydrant gasket inspections and flow tests. The inspectors noted that OP 4103, Fire Protection Equipment Surveillance, included a schedule, list of locations, and acceptance criteria to adequately control the gasket inspections. The inspectors noted that OP 4105, Fire Protection Systems Surveillance, included a schedule, list of locations, and acceptance criteria to adequately control the flow tests. The inspectors also interviewed the project manager to review any operating experience or implementation issues.

Commitment 32

> Commitment 32: Implement the Metal-Enclosed Bus Inspection Program. Details are provided in LRA Amendment 16, Attachment 3 and LRA Amendment 23, Attachment 7.

The licensee revised plant component procedures to include steps to conduct cleaning and inspection of metal-enclosed bus ducting. These changes were made to ensure the monitoring of aging effects on metal-enclosed bus ducting is included in maintenance procedures. The inspectors reviewed Work Orders 52298615-04, "T-1-1A Main Transformer Outage Inspection," 52298263-02, "T-2-1A Auxiliary Transformer Refuel Outage PMs," and 52334425-0, "Isophase-bus, Outage PM – Clean Inspect and Test," for the recent cleaning of a section of bus ducting during the Fall 2011 refueling outage.

Commitment 33

> Commitment 33: Include within the Structures Monitoring Program provisions that will ensure an engineering evaluation is made on a periodic basis (at least once every 5 years) of groundwater to concrete. Sample will be monitored for sulfates, pH, and chlorides.

The inspectors noted that the groundwater monitoring program implemented by the applicant was included within the structural monitoring program to ensure an engineering evaluation was made on a periodic basis of at least once every 5 years of groundwater samples. The periodic ground water sample assessment evaluates the aggressiveness of groundwater to concrete. Samples are evaluated for sulfates, pH and chlorides.

Attachment 9.17 to the Procedure EN-DC-150, Revision 2, defined a non-aggressive groundwater as having: pH > 5.5, sulfates < 1500 ppm, and chlorides < 500 ppm. A condition report would be initiated to assess the effects of groundwater if it exceeded these thresholds. The inspectors reviewed groundwater test results to assess the implementation and effectiveness of the program.

Commitment 34

> Commitment 34: Implement the Bolting Integrity Program. Details are provided in an LRA Amendment 16, Attachment 2, and LRA Amendment 23, Attachment 5.

The Bolting Integrity Program is another program included within the Structural Monitoring Program. The Structural Monitoring Procedure has been enhanced and updated to clarify and provide additional guidance for assuring bolting integrity at present, and also during the Period of Extended Operation. The inspectors reviewed revised and updated procedures to verify the extent, clarity, and appropriateness of the guidance. Procedures reviewed included: EN-DC-150, "Condition Monitoring of Maintenance Rule Structures," including Attachments 9.1, 9.2, and 9.17; EN-DC-178; MMMP-TORQ-0212; and SEP-ISI-VTY-001. The inspectors discussed these

enhancements with the applicant's engineering and inspection personnel to determine the bases for the guidance.

Commitment 35

> Commitment 35: Provide within the System Walkdown Training Program a process to document biennial refresher training of Engineers to demonstrate inclusion of the methodology for aging management of plant equipment as described in EPRI Field Guide or comparable instructional guide.

The licensee has implemented a 25 hour classroom training program for system engineers to train the engineers in the methodology of detection of aging mechanisms. This program requires periodic refresher training in the same subject areas.

Commitment 36

> Commitment 36: If technology to inspect the hidden jet pump thermal sleeve and core spray thermal sleeve welds has not been developed and approved by the NRC at least 2 years prior to the period of extended operation, VYNPS will initiate plant-specific action to resolve this issue. That plant-specific action may be justification that the welds do not require inspection.

The licensee discovered indications in six jet pumps by ultrasonic testing in 1996 and repeated the ultrasonic test of the jet pumps after two subsequent cycles of operation. No growth was noted in the indications. The utility acceptably chose to use EVT-1 to continue monitoring the indications.

Because the licensee uses EVT-1 to monitor indications in six jet pumps originally discovered by ultrasonic testing, they do not strictly follow the guidance contained in BWRVIP 41 that flaws be subsequently examined by the method of original discovery. In addition the licensee has chosen to defer the ultrasonic testing of a series of inaccessible, or hidden, welds until a delivery system for ultrasonic testing can be devised. This means the licensee does not follow the guidance of BWRVIP 41 to perform a modified VT-1 of 100 percent of the hidden welds over two 6-year inspection cycles and 35 percent of these welds per inspection cycle after that.

The licensee's position is justified by BWRVIP 41, Section 2.3.3.5, which states that the hidden jet pump welds are far enough into the nozzle that failure at these welds would not result in the thermal sleeve disengaging from the nozzle before the riser contacted the shroud. If the jet pump thermal sleeve or riser piping severed, it would be detected through jet pump monitoring, which alarms if the riser pipe moves more than 10 percent while at or above a core flow of 42 Mlb/hr. Therefore, deferral of inspection of the inaccessible welds is justified in keeping with the guidance.

In addition, during the review of the aging management program implementing this commitment, the staff noted the safety evaluation report that accompanied the NRC's acceptance of BWRVIP 41 stated an aging management review of the nozzle thermal sleeve should be provided by users of the procedure. The licensee committed, as stated in 36 above, to plant-specific action to resolve this issue, 2 years prior to the period of

extended operation, if technology to inspect the hidden jet pump thermal sleeve and core spray thermal sleeve welds has not been developed and approved by the NRC.

The licensee generated "Aging Management Review of the Reactor Vessels Internals," AMRM-32, Revision 1, August 28, 2008, in line with the suggestion contained in the safety evaluation report associated with BWRVIP 41. In addition, in Commitment Closure Verification Form, LRS/CMS I. D. A-16808 LOR-LAR-2010-00267, the licensee recorded their rationale for not performing an ultrasonic test of the hidden and cores spray welds thus satisfying the commitment's requirements.

Commitment 37

> Commitment 37: Continue inspections in accordance with the steam dryer monitoring plan, Revision 3 in the event that the BWRVIP 139 is not approved prior to the period of extended operation.

As part of the application process, and in accordance with an audit finding (Item 204), Commitment 37 was created by the licensee in letter BVY 06-079, dated August 22, 2006, transmitting Amendment 11 of their application, to replace the Vermont Yankee specific steam dryer monitoring program with BWRVIP 139, "Steam Dryer Inspection and Flaw Evaluation Guidelines," if, and when, the program was approved by the NRC.

A contention, admitted for adjudication by the Atomic Safety and Licensing Board, was a claim the aging management program for the steam dryer was inadequate. The licensee's response was, in part, to commit to use the Boiling Water Reactor Vessel and Internals Project procedure 139 for inspection of the steam dryer. At the time this response was tendered, the procedure was not approved by the NRC. Acceptance of the procedure, by the Atomic Safety and Licensing Board, would mean the intervener could not, as part of the hearing, review the finally approved BWRVIP procedure and challenge its adequacy. The Atomic Safety and Licensing Board resolved this by prohibiting the applicant from using the Boiling Water Reactor Vessel and Internals Project procedure. The Atomic Safety and Licensing Board order stipulated the applicant amend their license in order to use the Boiling Water Reactor Vessel Internals Project procedure.

As a consequence, Atomic Safety and Licensing Board issued order LBP-08-25, dated November 24, 2008, which required specific elements of the Vermont Yankee steam dryer monitoring program be implemented without change. This order pointedly excluded the use of BWRVIP 139 without amending the license, effectively negating Commitment 37. This was done to require the licensee to apply to the NRC for a change to the condition, a public process, which would give stakeholders an opportunity to contest the solution.

The NRC made the ASLB order condition "S" of the license:

> "In accordance with Atomic Safety and Licensing Board Order LBP-08-25, dated November 24, 2008, notwithstanding any other provision of this license, the licensee, Nuclear Vermont Yankee, LLC, and the licensee Nuclear Operations,

> Inc. shall continue to perform and implement the continuous parameter monitoring, moisture content monitoring, and visual inspections specified in the SDMP at the intervals specified in General Electric Services Information Letter 644, Revision 2. These shall continue for the full term of the period of extended operation unless the provision of the license is duly amended."

The licensee implemented a revision to OPON-3178-01 to incorporate the moisture content monitoring requirements of the condition by way of license renewal action LO-LAR-2011-0073 CA 9. The licensee further revised OP 0631 to incorporate the moisture content monitoring requirements of the condition by way of LO-LAR-2011-0073 CA 10, and revised EN-CY-107 to add the condition to the section on obligations and commitments and to protect the necessary steps within the procedure to ensure moisture content monitoring is performed in accordance with GE SIL 644 Revision 2 by way of LO-WTHQN-2011-032 CA-069.

The inspectors reviewed Program Report SEP-RVI-006, Revision 3, showing the scheduled implementation of this license condition until 2019. The inspectors noted the schedule was titled "Attachment 3, Boiling Water Reactor Vessel Internals Project Report," and the steam dryer inspection was planned in accordance with the provisions of procedure BWRVIP 139A and General Electric notice SIL 644, Revision 2. The schedule included notations of VT1 and VT3 examinations going forward. The inspectors reviewed SEP-RVI-006, Revision 2, "Vermont Yankee Reactor Vessel Internals (RVI) Inspection Program Plan" Appendix L, "Steam Dryer."

Licensee personnel implemented the steam dryer inspection program scheduling the inspections in accordance with the intervals required by SIL 644. Vermont Yankee folded into its procedure the additional parameters of BWRVIP 139, Revision A, as "approved" by the NRC. The licensee is implementing the other requirements of the license condition in accordance with the statements in the condition.

The licensee issued Condition Report CR-VTY-2012-00227 to identify the residual references to the BWRVIP in the procedure. The condition report noted the licensee submitted a license amendment request on 12/22/11 (BVY 11-085), to implement BWRVIP 139A. The licensee used Commitment Management Program EN-LI-110, Revision 5, to track and change the commitment.

During the outage, subsequent to the issuance of the new license, the licensee did not implement the BWRVIP inspections, as evidenced by portions of "IVVI Final Report GE DRF 0000-0140-1232, IVVI Final Report No. GEH-7480-2FY6R4-HK1-IVVI." The licensee limited their interrogation of the dryer to previously discovered indications using the required SIL visual examinations. These examinations were implemented as part of the power up-rate requirements.

<u>Commitment 38 and 39, and License Condition 3.R</u>

> Commitment 38: The BWRVIP 116 report, which was approved by the staff, will be implemented at VYNPS with the conditions documented in Sections 3 and 4 of the Staff's final SE dated March 1, 2006, for the BWRVIP 116 report.

> Commitment 39: If the VYNPS Standby Capsule is removed from the reactor vessel without the intent to test it, the capsule will be stored in a manner which maintains it in a condition which would permit its future use including during the period of extended operation, if necessary.

BWRVIP 86 Revision 1 replaces BWRVIP 116 and is approved by the NRC.

Commitment 39 requirements are narrowed by License Condition 3.R to specify the future use must support the re-insertion into the reactor vessel. Condition 3.R states:

> "If any surveillance capsules are removed without the intent to test them, these capsules must be stored in a manner which maintains them in a condition which would support re-insertion into the reactor pressure vessel, if necessary."

The licensee incorporated these commitments into SEP-FTY-VTY, Revision 1, issued January 3, 2012, "Reactor Vessel Fracture Toughness and Surveillance Material Testing in Vermont Yankee." The inspectors noted the procedure also incorporated the other requirements of the license condition, including the requirement to submit to the NRC, for approval, any changes made to the capsule withdrawal schedule. The procedure also incorporates the requirement to incorporate changes affecting the time of withdrawal, as stipulated in BWRVIP 86, "Updated BWR Integrated Surveillance Program (ISP) Implementation Plan" into the design basis.

Commitment 42 - Bolted Cable Connections

> Commitment 42: Implement the Bolted Cable Connections Program. Details are provided in LRA Amendment 23, Attachment 7.

The program, as described in the LRA, is a one-time program to confirm that loosening of bolted connections is not occurring.

The inspectors reviewed the commitment completion review report and associated work orders to verify that the inspection program demonstrated that the loosening of bolted cable connections was not occurring.

The inspection program evaluated a sample of bolted cable connections by inspecting them visually and testing the connection resistances. Connection resistances were measured prior to and after maintenance which disconnected and reconnected the bolted cable connection. The acceptance criteria for connection resistances were that the as-found resistances must be within a factor of five of the as-left resistances.

The inspectors had several concerns about the program. The inspectors questioned the basis for the factor of five acceptance criteria. Entergy reviewed the acceptance criteria and determined that an appropriate acceptance criteria would be 125 micro-ohms based on an evaluation of voltage drop and heating. 125 micro-ohms is the result of a bounding calculation using the maximum loaded conductor connection at Vermont Yankee which is the 3750 kVA T-Vernon-Hydro Transformer at full load compared to the voltage-drop criteria used for a voltage sensitive connection at Vermont Yankee, such as

the 50 mV criteria used for the Station Battery installation. The inspectors reviewed the evaluation for the revised value and determined that there was a sufficient technical basis for the new acceptance criteria.

The total bolted connection population was determined and the sampling program of EPRI Report TR-107514 was applied. The confidence level criteria applied to a random population would have resulted in a minimum sample of 25 bolted connections. The guidance, however, gives selection criteria for circuit loading, adverse location, such as high temperature, high humidity, vibration, etc., that resulted in 220 bolted connections being selected.

After reviewing the data, the inspectors questioned samples recorded on a scale of ohms instead of micro-ohms. After reviewing the documented test equipment used to develop the data, Entergy determined some samples were taken with instruments incapable of reporting values in micro-ohms. Entergy agreed the samples performed with incorrect instruments were not valid samples for demonstrating that connections were adequate or inadequate, and subsequently removed the samples from the evaluation. The inspectors determined that removing the invalid samples was appropriate.

The inspectors questioned other samples recorded with large resistances. Entergy reviewed this issue and identified six samples in excess of the 125 micro-ohms threshold. The locations were all associated with connections made to transformer T-3-1B. The connections were C1333C and D on Phase A, C1333B and C of Phase B, and C1333C and E on Phase C. Entergy reviewed the associated work orders to verify the documented visual inspections of the connections did not report any signs of overheating. Overheating would have been expected for a connection with large resistance. Based on the lack of reported overheating and the location of the samples, Entergy suggested the large resistances were due to poor measuring techniques. To verify this, Entergy created a corrective action (LO-LAR-2010-00271 CA 4) to re-measure the connections during the next scheduled maintenance on the connections with high recorded resistances. The inspectors reviewed Entergy's evaluation and the work orders and agreed that there is reasonable assurance that the connections were not loose and that re-measuring the connections is appropriate.

In light of the previous concerns, the inspectors questioned the adequacy of the data available to provide reasonable assurance that this one-time program had demonstrated that the loosening of bolted connections was not occurring. Entergy provided the inspectors with operating experience reviews in the form of condition report searches, which showed that between January 1, 1998, and February 29, 2012, there were only two potential examples of bolted electrical connections loosening. CR-VTY-2007-02196 was a loose connection in the main transformer control panel and CR-VTY-2007-02605 was a loose connection to DG-3-1A output connector.

Entergy also provided the revision to VY-RPT-11-00017, Bolted Cable Connection Inspection Report, which documented 220 diverse samples. Of the samples, only six did not meet the initial acceptance criteria; but all six met the visual inspection acceptance

criteria and all six will be re-measured to confirm the results. The inspectors reviewed the operating experience results and revised report and agreed that Entergy had demonstrated reasonable assurance of the effectiveness of this one-time program.

Commitment 45

> Commitment 45: Enhance the service water integrity program to require a periodic visual inspection of the Residual Heat Removal Service Water (RHRSW) pump motor cooling internal surfaces for loss of material.

As recorded in Condition Report LO-LAR-2010-00274, the licensee revised the "Vermont Yankee Heat Exchanger Program" (EN-SEP-HX-001) to include the periodic visual inspection of the RHRSW pump motor cooling internal surfaces and to flush the RHRSW Pump Motor Coolers. Procedure OPOP-RHR-2124 "Residual Heat Removal System" has been revised to add Attachment 7 – "Coil Flush." This "Residual Heat Removal Service Water Pump Motor Cooling" attachment provides a procedure for performing a pre-inspection flush of the RHRSW Pump Motor Coolers.

Work Orders (00291967-01, 00291968-01, 00291969-01, and 00291970-01) were initiated to perform baseline cooler flushes and visual inspections. The licensee documented, via CR-VTY-2012-00218, efforts to perform a boroscopic visual inspection on a mockup of the RHRSW pump motor cooler. The boroscopic examination failed and CR-VTY-2012-00218, "Corrective Action Plan," contains various steps to remedy the failure. For example:

- Action A, 1. determine if a boroscope exists that can negotiate the piping elbows of the motor cooling coils.
- Action A, 2. determine if a repair technique is available to allow the inlet and outlet lines to be cut off for access.
- Action A, 3. determine if alternate NDE is available.
- Action A, 4. identify the cost and availability of replacement coils. The inspectors noted that replacement of the coils, without a destructive visual examination of the existent coils would require revising the commitment because no visual inspection would be performed.

The licensee stated that, although these motor coolers are original plant equipment subject to aging effects, the coolers are periodically inspected during operator rounds and no leakage has been detected visually.

Although no visual examination of the internal surface of the RHRSW pump motor cooling internal surfaces has been performed, the commitment to enhance the service water integrity program to require the inspection has been completed. Because the coolers currently meet design and operational requirements without leakage, and are visually inspected on a regular basis, there is adequate time for the licensee to find and implement an alternate solution.

Commitments 46 and 47

> Commitment 46: Enhance the Diesel Fuel Monitoring Program to specify that fuel oil in the fire pump diesel storage (day) tank will be analyzed in accordance with ASTM D975-02 and for particulates per ASTM D2276. Also, fuel oil in the John Deere diesel storage tank will be analyzed for particulates per ASTM D2276.
>
> Commitment 47: Enhance the Diesel Fuel Monitoring Program to specify that fuel oil in the common portable fuel oil storage tank will be analyzed in accordance with ASTM D975-02, per ASTM D2276 for particulates, and ASTM D1796 for water and sediments.

The inspectors reviewed the license renewal application, Safety Evaluation Report, and the licensee implementation plan, and discussed these commitments with applicable plant staff and license renewal personnel. The inspectors reviewed the chemistry procedure used to sample and test diesel fuel oil, which had been revised to include the fire pump diesel, John Deere diesel, and common portable fuel oil storage tanks per the applicable standards. The inspectors reviewed five completed fuel oil analyses for the fire pump and John Deere diesels. The common portable fuel oil storage tank is stored empty and used only as needed; no usage has occurred subsequent to the enhancement.

Commitment 49

> Commitment 49: Revise station procedures to specify fire hydrant hose testing, inspection, and replacement, if necessary, in accordance with NFPA code specifications for fire hydrant hoses.

The inspectors reviewed the commitment completion review report and applicable surveillance procedure to verify that the procedures had been enhanced to include guidance in accordance with NFPA 1962-2008, Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose. The inspectors noted that OP 4104, Fire Hose Service Test Surveillance, included the requirements of NFPA 1962. The inspectors also interviewed the project manager to review any operating experience or implementation issues.

Commitment 50

> Commitment 50: During the period of extended operation, review the Vernon Dam owner Federal Energy Regulatory Commission (FERC) required report(s) at a minimum of every 5 years to confirm that the Vernon Dam owner is performing the required FERC inspections. Document deficiencies in the licensee Corrective Action Program and evaluate operability as described in BVY 96-043 and BVY 97-043, if it is determined that the required inspections are not being performed.

In a letter dated July 3, 2007, the licensee committed to confirm the Vernon Dam owner is performing the required FERC inspections based on a review of the Vernon Dam owner's report to FERC. On July 14, 2011, the licensee submitted a request FERC for a copy of the "Dam Safety Inspection Report" for the Vernon Project for the period May 11, 2005 to June 2, 2008. On September 16, 2011, FERC granted the licensee access to the report in Release Letter, CEII No. CE11-181. Because the licensee was granted access, they were able to review the Vernon Dam owner's report to the FERC, as stipulated in Commitment 50.

Commitment 55

> Commitment 55: Enhance safety-related coatings programs and procedures to be consistent with the recommendation of NUREB-1801, Section XI.S8, Protective Coating Monitoring and Maintenance Program.

In Appendix B of the license renewal application, the licensee stated a Protective Coatings inside Containment Program is not applicable. Subsequently, in Entergy correspondence dated December 21, 2010 (BVY 10-058), the licensee provided a new aging management program for protective coatings inside containment, in order to prevent coatings inside containment from contributing to Emergency Core Cooling System challenges during an event during the period of extended operation. Commitment 55 was noted in the correspondence at the bottom of Page 2 of Attachment 2.

This program was further expanded in correspondence dated February 4, 2011 (BVY 11-010). This included a lengthy description of the 10 program elements aligned with the Standard Review Plan for License Renewal.

The NRC then developed a "Supplemental Safety Evaluation Report Related to the License Renewal of Vermont Yankee Nuclear Power Station," sending the licensee a copy by letter dated March 21, 2011. The licensee commented on the safety evaluation report by letter, dated May 19, 2011 (BVY 11-033), in which the licensee suggested 18 corrections, errata, and edits. Comment Number 18 points out "LRA Commitment No. 55 is not listed in the Appendix. It is referenced and discussed in Section 3.0.3.1.13." In this section of the safety evaluation report: "The staff also notes that the applicant committed (Commitment No. 55) to enhance the safety-related coatings program and procedures to be consistent with the recommendations of GALL AMP XI.S8."

As a consequence, the omission of Commitment 55 from Appendix A of the Safety Evaluation Report, creating a new aging management program for the control of coating inside containment, was not controlled by the provisions of License Condition Q. Any modification to the commitment can be implemented using NEI 99-04 and 10 CFR 50.59. The licensee treated this commitment like all the other commitments they made that were registered in Appendix A of the safety evaluation report and entered this commitment into their commitment tracking system as A-16964 and tracked it to completion under LO-LAR-2010-0367, which revised program SEP-COAT-001 and procedure EN-DC-220.

b.1 Findings/Observations

No findings were identified. The inspectors determined the licensee has completed the reviewed commitments and is implementing the selected license conditions with the exceptions as noted in their completion letter (BVY 12-017), dated March 16, 2012, submitted in accordance with License Condition 3. Q .

a.2 Inspection Scope

The inspectors verified systems, structures, and components, "newly identified" as part of 10 CFR 54.37(b), and Regulatory Issue Summary RIS-2007-16, are implemented in accordance with 10 CFR Part 54.

Vermont Yankee Procedure SEP-LR-VTY-001, Revision 0, January 2012, describes the method for determining if reporting is required by 10 CFR 54.37(b) and performing an aging management review or Time Limited Aging Analysis evaluation. This procedure was referenced in the licensee Nuclear Management Manual EN-DC-115, Revision 12, "Engineering Change Process" in order to assure any current license basis changes would capture systems, structures, and components that were not in the scope of license renewal when the NRC approved the license renewal application, or would have been in the scope of license renewal if 10 CFR 54.4(a) were applied to the systems, structures, and components.

b.2 Findings/Observations

No findings were identified. The licensee is implementing the requirements of 10 CFR 54.37(b).

4OA6 Exit Meeting

The inspectors presented the inspection results to Mr. Christopher Wamser, Site Vice President, and other members of his staff on March 20, 2012. Additional discussions occurred in interim meetings of January 26 and March 8, 2012. The inspectors confirmed no proprietary material was examined during the inspection.

ATTACHMENT

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

C. Wamser, VY General Manager/Site Vice President
B. Wanczyk, VY Licensing Manager
G. Thomas, VY LR Project Manager
P. Guglielmino, VY LR Project Implementation Manager
J. Hoffman, VY LR Team
D. Lach, Entergy LR Team
J. DeVincentis, VY Licensing Engineer

DOCUMENTS REVIEWED

Corrective Action Reports

CR-VTY-2001-00829
CR-VTY-2011-02335
CR-VTY-2012-00218
CR-VTY-2012-00297
CR-VTY-2012-00218
CR-VTY-2012-00350
CR-VTY-2004-02183
CR-VTY-2005-03653
CR-VTY-2007-02190
CR-VTY-2007-02288
CR-VTY-2008-04297
CR-VTY-2008-04549
CR-VTY-2008-04571
CR-VTY-2011-03205
CR-VTY-2011-05520
CR-VTY-2012-00511
LO-LAR-2010-00244
LO-LAR-2010-00246
LO-LAR-2010-00271
LO-LAR-2010-00250
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LO-LAR-2010-00026
LO-LAR-2010-00240
LO-LAR-2010-00248
LO-LAR-2011-00094
LO-LAR-2010-00259
LO-LAR-2010-00260
LO-LAR-2010-00261
LO-LAR-2010-00263
LO-LAR-2010-00266

License Renewal Application

A.2.1.7 BWR Vessel Internals Program
A.2.1.28 Service Water Integrity Program
A.2.1.24 Periodic Surveillance And Preventive Maintenance Program
A.2.1.32 System Walkdown Program
B.1.22 Periodic Surveillance and preventative Maintenance Program

Drawings & Sketches

General Electric drawing 729E957, Revision 3; Vermont Yankee Reactor Core Support (NY 706102-530)
General Electric drawing 919D294, Revision 8; Vermont Yankee Reactor Vessel (NY 706102-5920-19)
General Electric drawing 729E956, Revision 0; Vermont Yankee Reactor Shroud (NY 706102-5920-529)
General Electric drawing 729E959, Revision 3; Vermont Yankee Core Structure Arrangement (NY 5920-532)
The licensee Nuclear Vermont Yankee, Vernon, VT, drawing 5920-1102, R HEADS, Nuclear Reactor, General Electric Company, Central Vermont Power Company, Vernon Dam, Vermont (NY 5290-252)
MPR Associates drawing, Vermont Yankee Power Station, Shroud Repair, Shroud Restraint Assembly 1249-006-01, Revision D
Engineering Evaluations, Analyses, Calculations & Standards:
GE Instructions for Recirculating Water Pump Motors, Model SK26366BK1, Item 0157
TECO, Westinghouse Engineering Study, 2N19SN, Revision 2, 2005
The licensee Nuclear Vermont Yankee (ENVY) – Upper Bearing Cooler Study
The licensee Vermont Yankee Root Cause Analysis Report, CR-VTY-2004-2015, 7/16/04; Electrical Fault/Fire
ISA-7.0.01-1996, Quality Standard for Instrument Air, Approved 12 November 1996
The licensee Engineering Standard, ENN-MS-S-004 VY, Revision 5, 3/15/12; System Categorization

System & Program Health Reports & System Engineer Walkdown Reports

RCIC Monthly Walkdown Report, 7/18/11
RCIC Monthly Walkdown Report, 8/11/11
RCIC Monthly Walkdown Report, 9/2/11
RHRSW Monthly Walkdown Report, 7/25/11
RHRSW Monthly Walkdown Report, 8/17/11
RHRSW Monthly Walkdown Report, 9/22/11
RBCCW Monthly Walkdown Report, 7/22/11
RBCCW Monthly Walkdown Report, 8/22/11
RBCCW Monthly Walkdown Report, 10/5/11
Fire Protection Monthly Walkdown Report, 9/1/11
Fire Protection Monthly Walkdown Report, 10/25/11
The licensee System Health Report, VY, Fire Protection, Period Q3-2011, 92.68 (WHITE)
The licensee System Health Report, VY, IA-105 – Instrument Air, 1/12/12, Period Q3-2011, 98.35 (GREEN)
The licensee System Health Report, VY, SA-105 – Service Air, 1/12/12, Period Q3-2011, 96.70 (GREEN)
The licensee System Health Report, VY, RCIC , 1/12/12, Period Q3-2011, K 87.32 (YELLOW)
The licensee System Health Report, VY, RHRSW, 1/12/12, Period Q3-2011, 100 (GREEN)
The licensee System Health Report, VY, RBCCW, 1/12/12, Period Q3-2011, 100 (GREEN)

Vermont Yankee Updated Final Safety Analysis Report

Section 10.11 FIRE PROTECTION SYSTEM

Program Documents

The licensee VY Heat Exchanger Program, ENN-SEP-HX-001, Revision 1
The licensee VY Service Water Program, ENN-SEP-SW-001, Revision 2
The licensee VY ENN Engineering Standard, ENN-MS-S-004-VY, Revision 5, 3/15/12; System Categorization

Procedures

Procedure RP 4620, Revision 19, Sampling and Analysis of Instrument And Containment Instrument Air Supplies, 11/30/10
The licensee Procedure, EN-DC-178, Revision 4, System Walkdowns (Non-Quality, Informational Use)
Vermont Yankee Power Station Procedure RP4620, Revision 20; Sampling and Analysis of Instrument And Containment Instrument Air Supplies
Vermont Yankee Power Station Operating Procedure 4019, Revision 30, 01/03/12; Surveillance of Plant Fore Barriers and Fire Rated Assemblies
Vermont Yankee Power Station Operating Procedure 4105, Revision 48, 01/03/12; Fire Protection Systems Surveillance
OP 4019, Surveillance of Plant Fire Barriers and Fire Rated Assemblies, Rev. 30
OP 4103, Fire Protection Equipment Surveillance, Rev. 56
OP 4104, Fire Hose Service Test Surveillance, Rev. 19
OP 4105, Fire Protection Systems Surveillance, Rev. 48
OPOP-PHEN-3127, Natural Phenomena Operating Procedure, Rev. 5

Work Orders & Work Requests

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WR 0029168
WR 0029169
WR 00291970
WR 00261977
WR 00261966
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WR 00242340
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WR 52298263
WR 52334425

Miscellaneous Documents

NRC Generic Letter 89-13; 7/18/89; Service Water System Problems Affecting Safety-Related Equipment
GE Nuclear Services Information Letter (SIL) Number 588R1, 5/18/95; TOP GUIDE AND CORE PLATE CRACKING
Vermont Yankee UFSAR, Revision 18; Section C.2.5.2 Internals Deformation Analysis General
License Renewal Application dated January 25, 2006, including Appendix A (FSAR Supplements) and Appendix B (Aging Management Programs)
NUREG 1907, Safety Evaluation Report, May 2008
NUREG 1907, Safety Evaluation Report, Supplement 1, September 2009
NUREG 1907, Safety Evaluation Report, Supplement 2, March 2011
The licensee letter BVY 06-091, dated October 17, 2006
The licensee letter BVY 07-018, dated March 23, 2007
The licensee letter BVY 10-069, dated December 30, 2010
The licensee letter BVY 11-001, dated January 21, 2011
The licensee letter BVY 11-007, dated February 4, 2011
EN-DC-346, Cable Reliability Program, Revision 2
EN-DC-348, Non-EQ Insulated Cables and Connections Inspection, Revision 2
EN-FAP-LR-027, License Renewal Sensitive Instrumentation Circuits Review AMP, Revision 0
ENN-SEP-CBL-VTY, Vermont Yankee Cable Reliability Program Plan, Revision 0
LRID-12-1, Review of the Fire Protection Aging Management Program for License Renewal Implementation at Vermont Yankee Nuclear Power Station, Revision 0
LRID-12-2, Review of the Fire Water System Aging Management Program for License Renewal Implementation at Vermont Yankee Nuclear Power Station, Revision 0
LRID-17, Review of the Non-EQ Inaccessible Medium-Voltage Cable Aging Management Program for License Renewal Implementation at VY Nuclear Power Station, Revision 0
LRID-18, Review of Non-EQ Instrumentation Circuits Rest Review Aging Management Program for License Renewal Implementation at Vermont Yankee Nuclear Power Station, Revision 0
LRID-19, Review of the Non-EQ Insulated Cables and Connections Aging Management Program for License Renewal Implementation at VY Nuclear Power Station, Revision 1
LRID-31, Review of Bolted Cable Connections Aging Management Program for License Renewal Implementation at Vermont Yankee Nuclear Power Station, Revision 0
OP 5307, Electrical Checkout of Neutron Monitoring Detectors, Revision 12
PP 7011, Vermont Yankee Fire Protection and Safe Shutdown, Revision 13
VY-RPT-11-00017, Bolted Cable Connection Inspection Report, Revision 0
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Evaluation of the Ultrasonic Testing Performed on the Diesel Fuel Oil Storage Tank, RFO-29, Jan. 20, 2012 (draft)
Evaluation of the Ultrasonic Testing Performed on the Diesel Fire Pump Fuel Oil Storage Tank, RFO-29, Jan. 20, 2012 (draft)
Fuel Oil Storage Tank (FOST) Ultrasonic Test (UT) Results, Oct. 23, 2011
Fire Pump Diesel Tank Ultrasonic Test (UT) Results, Nov. 29, 2011
VYBOP-11-UT-007, UT Erosion/Corrosion Examination – TK-40-1A, Oct. 23, 2011
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API Standard 653, Tank Inspection, Repair, Alteration, and Reconstruction, 4th Ed., April 2009
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EN-FAP-LR-025, Selective Leaching Inspection, Revision 1
VY-RPT-12-01, License Renewal Selective Leaching Inspection Summary Report, Revision 0 (draft)
Altran Solutions Technical Report No. 11-2318-TR-001, Evaluation of Selective Leaching on Various Components in Contact with Water, Dec. 2011
GZA GeoEnvironmental, Inc, Report No. 01.25576.13, Results of Soil Corrosivity Testing – Buried Pipe Initiative, Vermont Yankee, Dec. 12, 2011
Evaluation of the Gray Cast Iron Valves in the Fire Protection System Based on External Ultrasonic Test Examinations, Jan. 18, 2012
Selective Leaching Matrix, Jan. 25, 2012
PMRQ 50040601, task 3
ME163, Preventive Maintenance Basis – John Deere Diesel
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Quarterly water and sediment test (diesel fire pump) for samples on Sept. 15, 2011 and Dec. 19, 2011
NUREG-1801, Vol. 2, Revision 1, XI.6 Structural Monitoring Program
AP 0205, Controlled Use Monorai
OP 5241, Lifting Fixtures and Equipment
OP 52114, Cooling Tower Structural Inspection and Repair
EN-WM- 105, Planning
VYNPS-LRID-27-2, Review of the Structural Monitoring Aging Management Program

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LRID-09, Review of the Diesel Fuel Monitoring Aging Management Program, Revision 0
LRID-12-1, Review of the Fire Protection Aging Management Program, Revision 0
LRID-14, Review of the Heat Exchanger Monitoring Aging Management Program, Revision 0
LRID-21, Review of the One-Time Inspection Aging Management Program, Revision 1
LRID-25, Review of the Selective Leaching Aging Management Program, Revision 0
LRID-30-1, Review of the Water Chemistry Control – Auxiliary Systems Aging Management Program, Revision 0

LIST OF ACRONYMS

ASME	American Society of Mechanical Engineers
BWRVIP	Boiling Water Reactor Vessel Internals Project
CASS	Cast Austenitic Stainless Steel
CFR	Code of Federal Regulations
CUF	Cumulative Fatigue Usage Factors
EVT-1	Enhanced Visual Inspection Technique
FERC	Federal Energy Regulation Commission
GALL	Generic Aging Lessons Learned
IP	Inspection Procedure
ISP	Integrated Surveillance Program
LRA	License Renewal Application
NFPA	National Fire Protection Association
NRC	U.S. Nuclear Regulatory Commission
RHRSW	Residual Heat Removal Service Water
UFSAR	Updated Final Safety Analysis Report
UT	Ultrasonic Tests
VYNPS	Vermont Yankee Nuclear Power Station